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Look Mom, No Hands . . . The Automated Highway System

By Jodi Chew, Transportation Planning Engineer

A brief summer shower made the track glisten in the San Diego sun. The spectators, a truly international group, quietly took their places in anticipation of the upcoming event. At about ten o'clock the white vehicle sprang to life, deftly maneuvered down the track, and sped past the bleachers at 73 kilometers per hour (45 mph). The crowd roared and applauded. Cameras flashed and news cameras rolled.

The reason for the audience's enthusiastic response was that throughout the entire scenario the driver had his hands thrust out the car window and was waving happily. This symbolic victory lap signaled the opening of Demo '97, an event showcasing the Automated Highway System (AHS).

The AHS is a roadway equipped to allow the automatic operation of vehicles. In theory, the driver would steer his or her car to an automated check-point, release control of the vehicle to the system, and then just relax. While on the AHS the speed and spacing of vehicles would be controlled through communication between the vehicle and the system. Cars would form long strings of vehicles, called platoons, and cruise along at a uniform speed. Drivers would still be involved in passing and avoiding obstacles, but the AHS would assist with these maneuvers. The driver would assume full control of his/her vehicle upon exiting the AHS.

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The benefits of an AHS could be tremendous. Imagine, on the AHS you would experience less traffic congestion because you would now be able to drive in a platoon at full highway speed at a mere 6.4 meters (21 feet) from the car in front of you. You would have lower driver stress because you would have "auto-pilot." You would have less risk of accidents and injuries because changing lanes and avoiding obstacles would be computer assisted. Plus you would find your kilometers per liter (miles/gallon) would increase and the car's emissions would decrease because you would no longer have the erratic starts and stops.

To demonstrate the system in practice and allow participants at Demo '97 to experience the AHS, the HOV lanes of I-15 in San Diego were set up for six scenarios. Demo participants sat in cars speeding down the highway in platoon formation at a uniform 64 to 105 kilometers per hour (40 to 65 miles per hour). They sat in cars accelerating to join a platoon and decelerating to leave a platoon. They experienced AHS assisted passing maneuvers and sudden stops in cars and buses. All the while the system controlled the driving, which was unnerving at first. As a passenger in one of these vehicles, I found my foot searching for an imaginary brake as we sped up to catch the car in front. However, my apprehension disappeared as we smoothly glided in to match the platoon's speed and seamlessly latched on to the train of cars. It was an impressive ride.

Even more impressive were the different technologies that made the AHS ride possible.

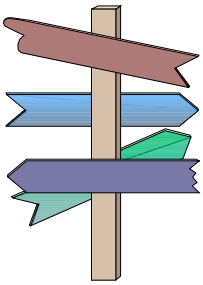
Vehicles from Ohio State University use information from a radar-reflective stripe placed in the travel lane. This stripe is read by radar sensors, interpreted by a control system, and translated into proper guidance for the vehicles. The Ohio State vehicles also have an additional "vision system" that uses the existing lane markings and the vehicle's front and side radar to analyze proximity to other vehicles and obstacles. The system processes this information and indicates to a driver when a safe lane change can be initiated.

Vehicles from the University of California's Partners for Advanced Transit and Highways (PATH) use slender magnetic cylinders buried 1.2 meters (4 feet) apart in the center of the lane. The polarity and sequence of these magnets relay information about the roadway to a sensor and a computer located on board the vehicle. An algorithm then translates this data into an appropriate steering command for the vehicle. The PATH cars "speak" to one another via radar and radio. A break in this communication between vehicles indicates a problem in the platoon and initiates a fault management response. A message is broadcast to the other vehicles in the platoon and an appropriate action (e.g. increasing of distance between vehicles) then ripples through the platoon.

The integration of the human driver with the AHS is a huge undertaking. Tough questions such as how much control the driver should maintain, how much control the system should absorb, and how the system and driver should pass this control of the vehicle back and forth have not yet been fully answered. Designing a system to accommodate the many situations and myriad of driver responses means introduction of numerous variables to the AHS equation. This is a complex challenge that the National Automated Highway System Consortium (NAHSC) continues to address.

Though full implementation of an AHS has not yet arrived, the Demo at San Diego proved that what used to be dreams and theory is now being put into practice. Although challenges remain, someday we may all enjoy the benefits of the AHS. And when that happens, "driving" will never be the same**.**

ROAD SIGNS



Thirty spokes converge upon a single hub;
It is on the hole in the center that the use of
the cart hinges.

We make a vessel from a lump of clay;
It is the empty space within the vessel that makes it
useful.

We make doors and windows for a room;
But it is these empty spaces that make the room livable.

Thus, while the tangible has advantages,
It is the intangible that makes it useful.

- John Wu

We wish to thank all the individuals who have contributed articles for previous newsletters. If you are aware of a new technology, (or a fresh spin on an old one) please jot down your ideas and submit them via e-mail to me at the address below. Or, if you have an aversion to writing, just donate 15 minutes of your time for an interview (either by phone or in person), and I'll format the information for you. You can then review the article for accuracy (via e-mail or hard copy) and upon publication, you'll become famous in a matter of days. Remember, although we cater to road-related technology, ANY new technology information is welcome.

Please send all submissions to Kristi Swisher - (360.696.7572). Be sure your name, title, and phone number are the way you want them to appear in the article. Articles are subject to editor/ layout approval and may be condensed if space is limited.

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